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TRANSMITTAL FORM

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ENCLOSURES *(Check all that apply)*

- [x] Fee Transmittal Form
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Letter Re: Priority Claim

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Joseph Conneely, Registration No. 54,883
Signature	J. Conneely
Date	Feb. 4/04

CERTIFICATE OF TRANSMISSION/MAILING

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ATTORNEY DOCKET NO.: 16350-36US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

In re patent application of:

BAAR, David et al.

Serial No.: 10/667,887 Group Art Unit: 3621

Filed: September 23, 2003

Title: Detail –In-Context Lenses For Interacting With Objects In Digital Image Presentations

February 4, 2004

The Commissioner of Patents & Trademarks
P.O. Box 1450
Alexandria, Virginia 22313-1450

PRIORITY CLAIM

Dear Sir:

The benefit of the filing date in Canada of a patent application corresponding to the above-identified application, is hereby claimed under Rules 37 CFR 1.55 and 35 U.S.C. 119 in accordance with the Paris Convention for the Protection of Industrial Property. Certified copies of the corresponding Canadian patent applications bearing Serial Nos. 2,406,131 and 2,406,047 both filed September 30, 2002, are submitted herewith.

Respectfully submitted,

Feb 4/04
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This is to certify that the documents attached hereto and identified below are true copies of the documents on file in the Patent Office.

Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,406,131**, on September 30, 2002, by **IDELIX SOFTWARE INC.**, assignee of David Barr, for "A Graphical User Interface Using Detail-in-Context Folding".

L. Lachance

Agent certificateur/Certifying Officer

January 20, 2004

Date

Canada

(CIPO 68)
04-09-02

OPIC CIPO

A GRAPHICAL USER INTERFACE USING DETAIL-IN-CONTEXT FOLDING

The invention relates to the field of computer graphics processing, and more specifically to a graphical user interface using detail-in-context folding.

BACKGROUND OF THE INVENTION

Display screens are the primary visual display interface to a computer. One problem with these visual display screens is that they are limited in size, thus presenting a challenge to user interface design, particularly when larger amounts of information is to be displayed. This problem is normally referred to as the "screen real estate problem".

Well-known solutions to this problem include panning, zooming, scrolling or combinations thereof. While these solutions are suitable for a large number of visual display applications, these solutions become less effective where the visual information is spatially related, such as maps, newspapers and such like. In this type of information display, panning, zooming and/or scrolling is not as effective as much of the context of the panned, zoomed or scrolled display is hidden.

A recent solution to this problem is the application of "detail-in-context" presentation techniques. Detail-in-context is the magnification of a particular region of interest (the "focal region" or "detail") in a data presentation while preserving visibility of the surrounding information (the "context"). This technique has applicability to the display of large surface area media, such as maps, on limited size computer screens including laptop computers, personal digital assistants ("PDAs"), and cell phones.

In the detail-in-context discourse, differentiation is often made between the terms "representation" and "presentation". A representation is a formal system, or mapping, for specifying raw information or data that is stored in a computer or data processing system. For example, a digital map of a city is a representation of raw data including street names and the relative geographic location of streets and utilities. Such a representation may be displayed visually on a computer screen or printed on paper. On the other hand, a presentation is a spatial organization of a given representation that is appropriate for the task at hand. Thus, a presentation of a representation organizes such things as the point of view and the relative

emphasis of different parts or regions of the representation. For example, a digital map of a city may be presented with a region magnified to reveal street names.

In general, a detail-in-context presentation may be considered as a distorted view (or distortion) of a portion of the original representation where the distortion is the result of the application of a "lens" like distortion function to the original representation. A detailed review of various detail-in-context presentation techniques such as Elastic Presentation Space may be found in a publication by Marianne S. T. Carpendale, entitled "A Framework for Elastic Presentation Space" (Carpendale, Marianne S. T., *A Framework for Elastic Presentation Space* (Burnaby, British Columbia: Simon Fraser University, 1999)), and incorporated herein by reference.

In general, detail-in-context data presentations are characterized by magnification of areas of an image where detail is desired, in combination with compression of a restricted range of areas of the remaining information (i.e. the context), the result typically giving the appearance of a lens having been applied to the display surface. Using the techniques described by Carpendale, points in a representation are displaced in three dimensions and a perspective projection is used to display the points on a two-dimensional presentation display. In detail-in-context presentation systems, when a lens is applied to a two-dimensional continuous surface representation, for example, the resulting presentation appears to be three-dimensional. In other words, the lens transformation appears to have stretched the continuous surface in a third dimension.

One shortcoming of present graphical user interfaces for operating systems and software applications is that user interface elements such as pop-up and drop-down menus comprised of lists of programs (i.e. in the case of operating systems) and function selections (i.e. in the case of software applications) often obscure or occlude other important information on the user's display screen including data, desktop icons, and other graphical elements. This is an example of the screen real estate problem referred to above.

A need therefore exists for a graphical user interface for operating system and software application menus that avoids occlusion of displayed information. Consequently, it is an object of the present invention to obviate or mitigate at least some of the above mentioned disadvantages.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention may best be understood by referring to the following description and accompanying drawings. In the description and drawings, line numerals refer to like structures or processes. In the drawings:

FIG. 1 is a graphical representation of the geometry for constructing a three-dimensional (3D) perspective viewing frustum, relative to an x, y, z coordinate system, in accordance with known elastic presentation space graphics technology;

FIG. 2 is a graphical representation of the geometry of a presentation in accordance with known elastic presentation space graphics technology;

FIG. 3 is a block diagram illustrating an exemplary data processing system for implementing an embodiment of the invention;

FIG. 4 is a screen capture illustrating an operating system GUI in accordance with the prior art;

FIG. 5 is a screen capture illustrating the operating system GUI of FIG. 4 with a selected pop-up menu in accordance with the prior art; and,

FIG. 6 is a screen capture illustrating an operating system GUI using detail-in-context folding in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following description, numerous specific details are set forth to provide a thorough understanding of the invention. However, it is understood that the invention may be practiced without these specific details. In other instances, well-known software, circuits, structures and techniques have not been described or shown in detail in order not to obscure the invention. In the drawings, like numerals refer to like structures or processes.

The term "data processing system" is used herein to refer to any machine for processing data, including the computer systems and network arrangements described herein. The term "Elastic

Presentation Space" ("EPS") (or "Pliable Display Technology" ("PDT")) is used herein to refer to techniques that all w for the adjustment of a visual presentation without interfering with the information content of the representation. The adjective "elastic" is included in the term as it implies the capability of stretching and deformation and subsequent return to an original shape. EPS graphics technology is described by Carpendale in "A Framework for Elastic Presentation Space" (Carpendale, Marianne S. T., *A Framework for Elastic Presentation Space* (Burnaby, British Columbia: Simon Fraser University, 1999)), which is incorporated herein by reference. In EPS graphics technology, a two-dimensional visual representation is placed onto a surface; this surface is placed in three-dimensional space; the surface, containing the representation, is viewed through perspective projection; and the surface is manipulated to effect the reorganization of image details. The presentation transformation is separated into two steps: surface manipulation or distortion and perspective projection.

FIG. 1 is a graphical representation **100** of the geometry for constructing a three-dimensional ("3D") perspective viewing frustum **220**, relative to an x, y, z coordinate system, in accordance with known elastic presentation space (EPS) graphics technology. In EPS technology, detail-in-context views of two-dimensional ("2D") visual representations are created with sight-line aligned distortions of a 2D information presentation surface within a 3D perspective viewing frustum **220**. In EPS, magnification of regions of interest and the accompanying compression of the contextual region to accommodate this change in scale are produced by the movement of regions of the surface towards the viewpoint ("VP") **240** located at the apex of the pyramidal shape **220** containing the frustum. The process of projecting these transformed layouts via a perspective projection results in a new 2D layout which includes the zoomed and compressed regions. The use of the third dimension and perspective distortion to provide magnification in EPS provides a meaningful metaphor for the process of distorting the information presentation surface. The 3D manipulation of the information presentation surface in such a system is an intermediate step in the process of creating a new 2D layout of the information.

FIG. 2 is a graphical representation **200** of the geometry of a presentation in accordance with known EPS graphics technology. EPS graphics technology employs viewer-aligned perspective projections to produce detail-in-context presentations in a reference view plane **201** which may be viewed on a display. Undistorted 2D data points are located in a basal plane **210** of a 3D

perspective viewing volume or frustum **220** which is defined by extreme rays **221** and **222** and the basal plane **210**. The VP **240** is generally located above the centre point of the basal plane **210** and reference view plane ("RVP") **201**. Points in the basal plane **210** are displaced upward onto a distorted surface **230** which is defined by a general 3D distortion function (i.e. a detail-in-context distortion basis function). The direction of the viewer-aligned perspective projection corresponding to the distorted surface **230** is indicated by the line FPo - FP **231** drawn from a point FPo **232** in the basal plane **210** through the point FP **233** which corresponds to the focus or focal region or focal point of the distorted surface **230**.

EPS is applicable to multidimensional data and is well suited to implementation on a computer for dynamic detail-in-context display on an electronic display surface such as a monitor. In the case of two dimensional data, EPS is typically characterized by magnification of areas of an image where detail is desired **233**, in combination with compression of a restricted range of areas of the remaining information (i.e. the context) **234**, the end result typically giving the appearance of a lens **230** having been applied to the display surface. The areas of the lens **230** where compression occurs may be referred to as the "shoulder" **234** of the lens **230**. The area of the representation transformed by the lens may be referred to as the "lensed area". The lensed area thus includes the focal region and the shoulder. To reiterate, the source image or representation to be viewed is located in the basal plane **210**. Magnification **233** and compression **234** are achieved through elevating elements of the source image relative to the basal plane **210**, and then projecting the resultant distorted surface onto the reference view plane **201**. EPS performs detail-in-context presentation of n-dimensional data through the use of a procedure wherein the data is mapped into a region in an (n+1) dimensional space, manipulated through perspective projections in the (n+1) dimensional space, and then finally transformed back into n-dimensional space for presentation. EPS has numerous advantages over conventional zoom, pan, and scroll technologies, including the capability of preserving the visibility of information outside **234** the local region of interest **233**.

For example, and referring to FIGS. 1 and 2, in two dimensions, EPS can be implemented through the projection of an image onto a reference plane **201** in the following manner. The source image or representation is located on a basal plane **210**, and those regions of interest **233** of the image for which magnification is desired are elevated so as to move them closer to a

reference plane situated between the reference viewpoint **240** and the reference view plane **201**. Magnification of the focal region **233** closest to the RVP **201** varies inversely with distance from the RVP **201**. As shown in FIGS. 1 and 2, compression of regions **234** outside the focal region **233** is a function of both distance from the RVP **201**, and the gradient of the function describing the vertical distance from the RVP **201** with respect to horizontal distance from the focal region **233**. The resultant combination of magnification **233** and compression **234** of the image as seen from the reference viewpoint **240** results in a lens-like effect similar to that of a magnifying glass applied to the image. Hence, the various functions used to vary the magnification and compression of the source image via vertical displacement from the basal plane **210** are described as lenses, lens types, or lens functions. Lens functions that describe basic lens types with point and circular focal regions, as well as certain more complex lenses and advanced capabilities such as folding, have previously been described by Carpendale.

System. FIG. 3 is a block diagram of an exemplary data processing system **300** for implementing an embodiment of the invention. The data processing system is suitable for implementing EPS technology and for viewing detail-in-context presentations in conjunction with a graphical user interface ("GUI"). The data processing system **300** includes an input device **310**, a central processing unit or CPU **320**, memory **330**, and a display **340**. The input device **310** may include a keyboard, mouse, trackball, or similar device. The CPU **320** may include dedicated coprocessors and memory devices. The memory **330** may include RAM, ROM, databases, or disk devices. And, the display **340** may include a computer screen or terminal device. The data processing system **300** has stored therein data representing sequences of instructions which when executed cause the method described herein to be performed. Of course, the data processing system **300** may contain additional software and hardware a description of which is not necessary for understanding the invention.

GUI Using Detail-In-Context Folding. FIG. 4 is a screen capture illustrating an operating system GUI in accordance with the prior art. FIG. 5 is a screen capture illustrating the operating system GUI of FIG. 4 with a selected pop-up menu in accordance with the prior art. As mentioned, one shortcoming of present graphical user interfaces for operating systems and software applications is that user interface elements such as pop-up and drop-down menus comprised of lists of programs (i.e. in the case of operating systems) and function selections (i.e. in the case of

software applications) often obscure or occlude other important information on the user's display screen including data, desktop icons, and other graphical elements. For example, the appearance of the appearance of the pop-up "Start Menu" in FIG. 5 has occluded the visibility of desktop i ons from view.

PDT and EPS technology includes a concept, which may be referred to as "folding", in which an in-context detail view of information can be displaced so as to move the region of interest within the plane of the display, while retaining a continuous connection with some of the contextual information. According to one embodiment of the present invention, folding is applied to the GUI of an operating system or software application to displace the occluding user interface elements and expose the underlying information or graphical elements.

FIG. 6 is a screen capture illustrating an operating system GUI using detail-in-context folding in accordance with an embodiment of the invention. In FIG. 6, the operating system is Microsoft XP. A copy of the unoccluded desktop from FIG. 4, prior to invoking the Start Menu illustrated in FIG. 5, has been retained to bring back the original icons for display.

In accordance with another embodiment of the invention, folding can be applied to a drop-down (or pull-down) menu in the user interface for an application to prevent or remove occlusion of data in the program.

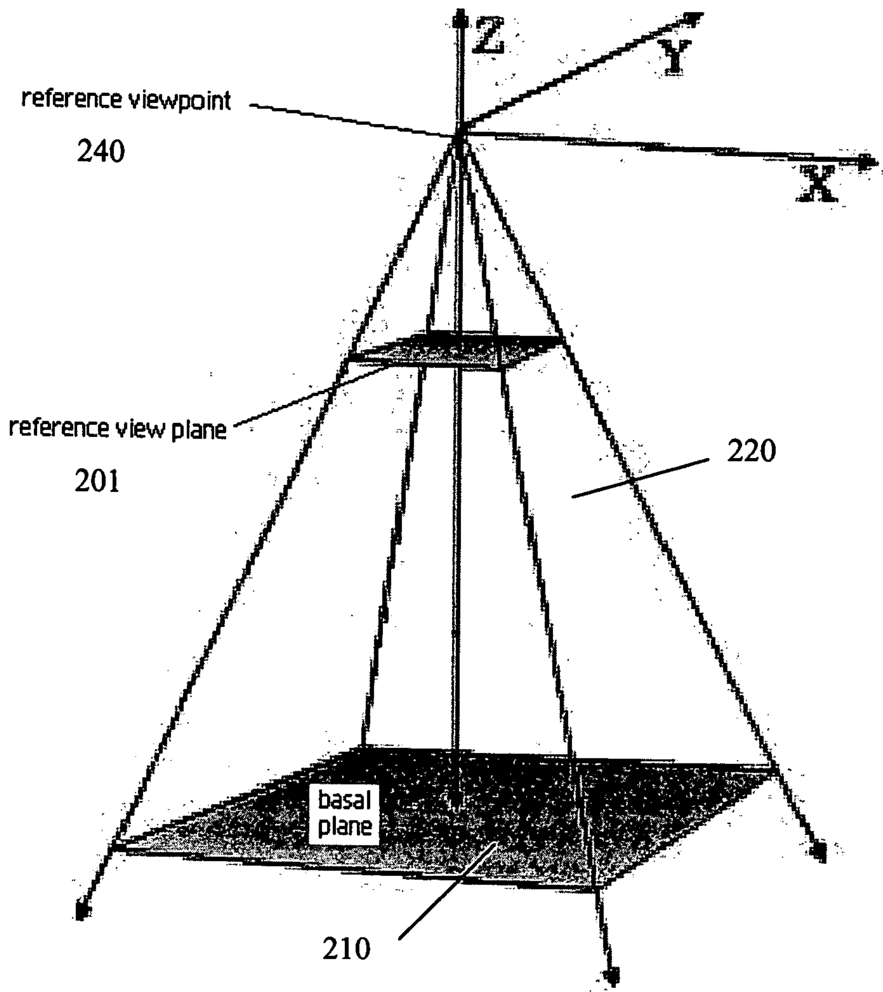
Data Carrier Product. The sequences of instructions which when executed cause the method described herein to be performed by the exemplary data processing system of FIG. 3 can be contained in a data carrier product according to one embodiment of the invention. This data carrier product can be loaded into and run by the exemplary data processing system of FIG. 3.

Computer Software Product. The sequences of instructions which when executed cause the method described herein to be performed by the exemplary data processing system of FIG. 3 can be contained in a computer software product according to one embodiment of the invention. This computer software product can be loaded into and run by the exemplary data processing system of FIG. 3.

Integrated Circuit Product. The sequences of instructions which when executed cause the method described herein to be performed by the exemplary data processing system f FIG. 3 can

be contained in an integrated circuit product including a coprocessor or memory according to one embodiment of the invention. This integrated circuit product can be installed in the exemplary data processing system of FIG. 3.

100



Z
Y
reference viewpoint
240
X
reference view plane
201
220
basal
plane
210

FIG. 1

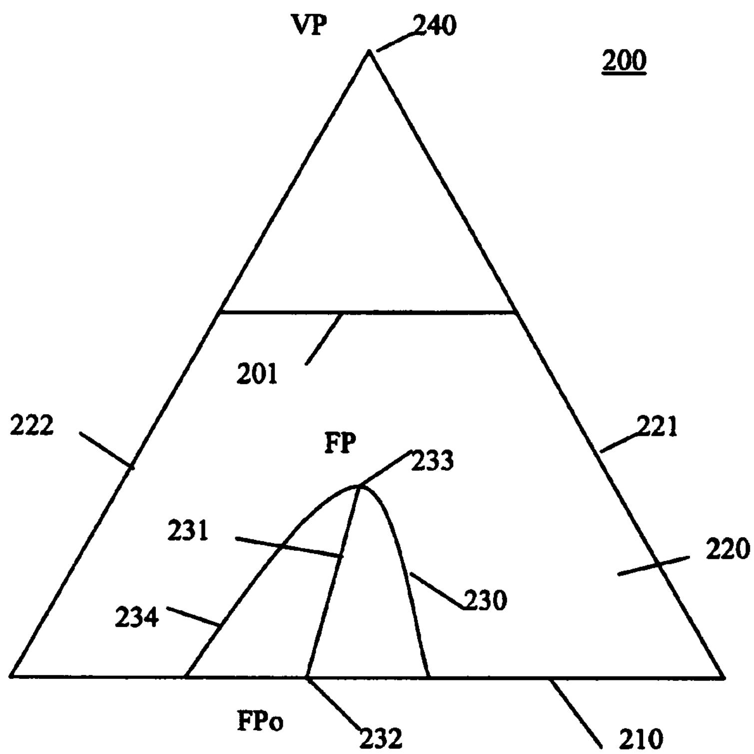


FIG. 2

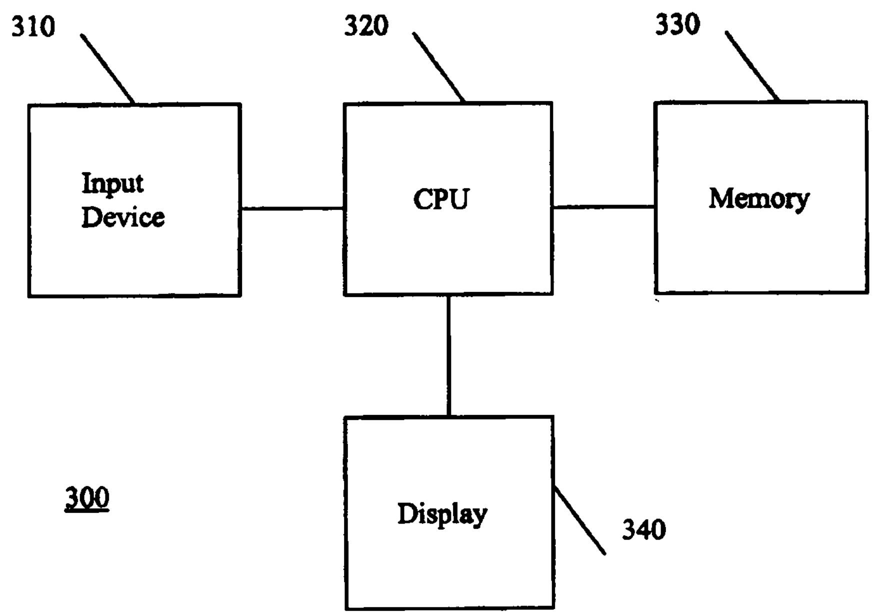


FIG. 3

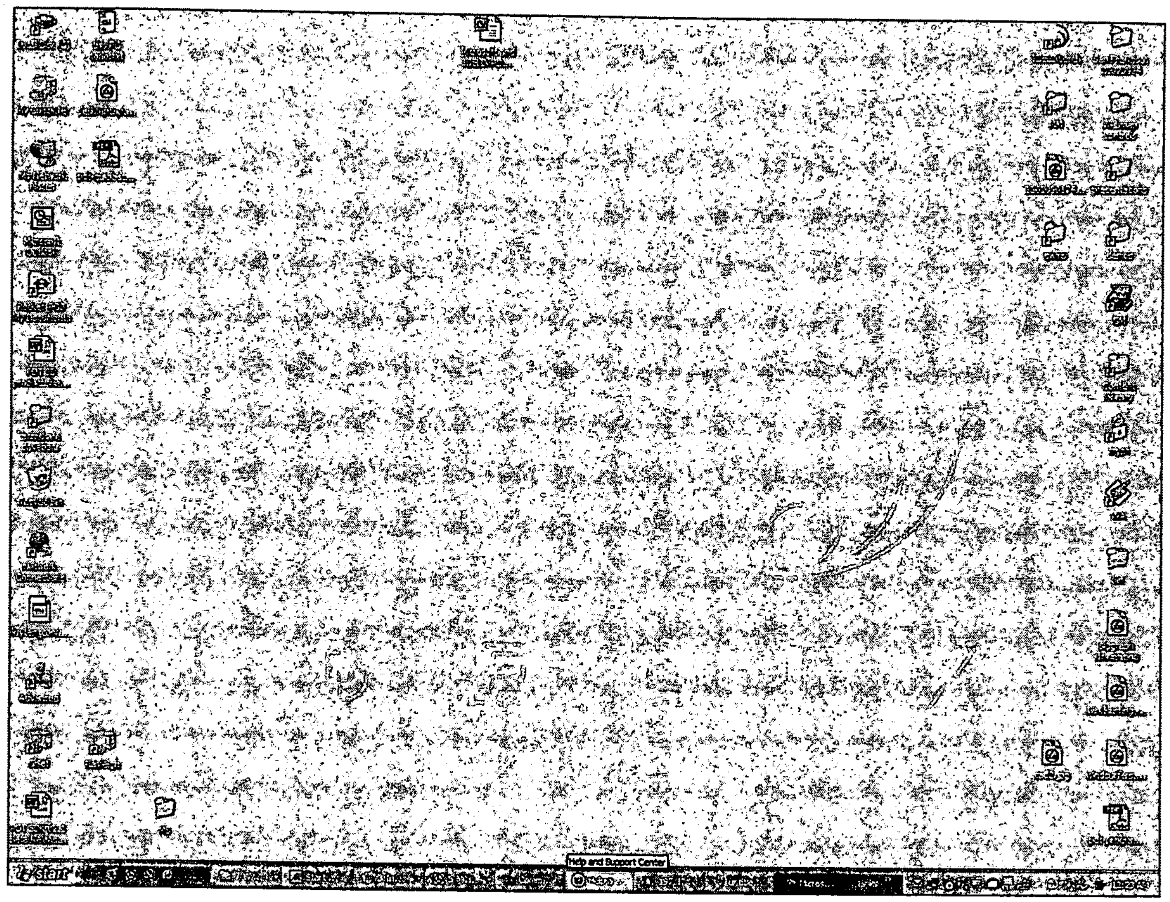
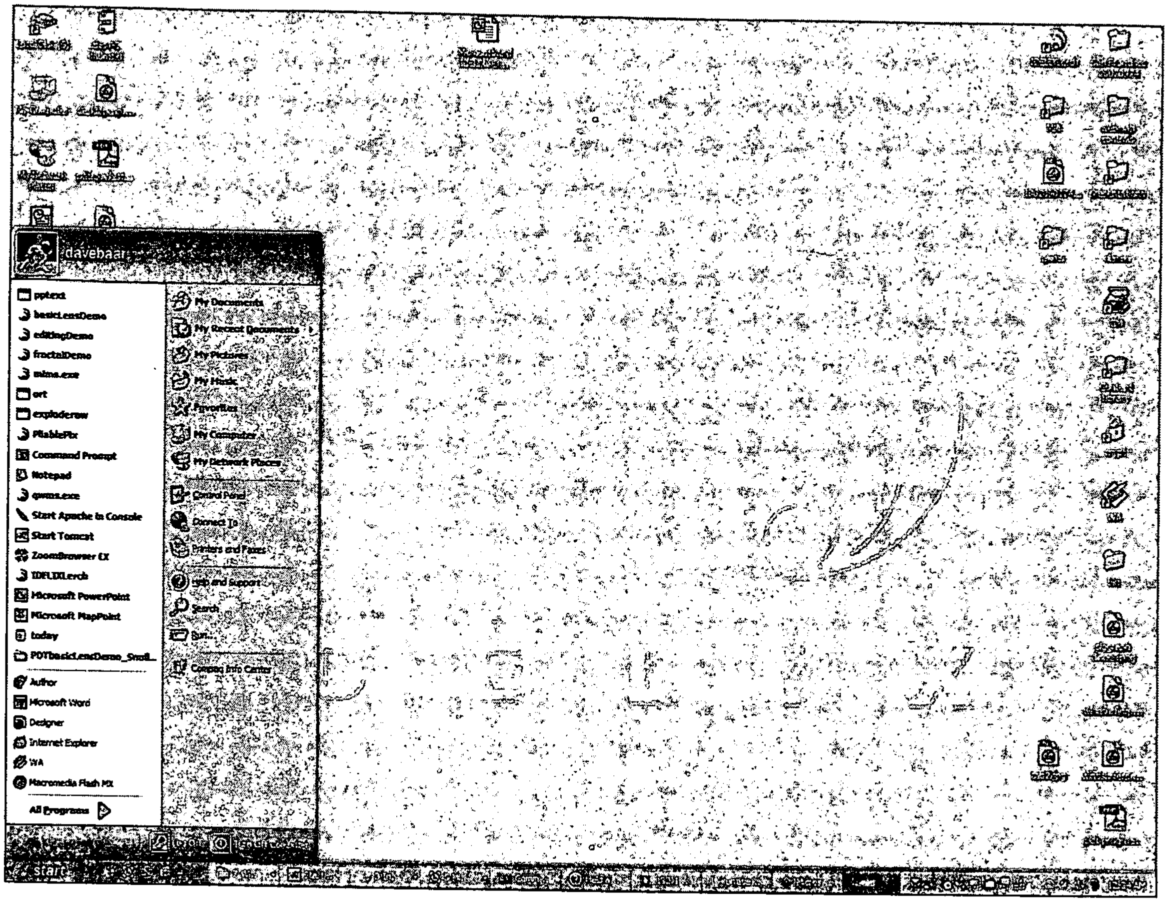


FIG. 4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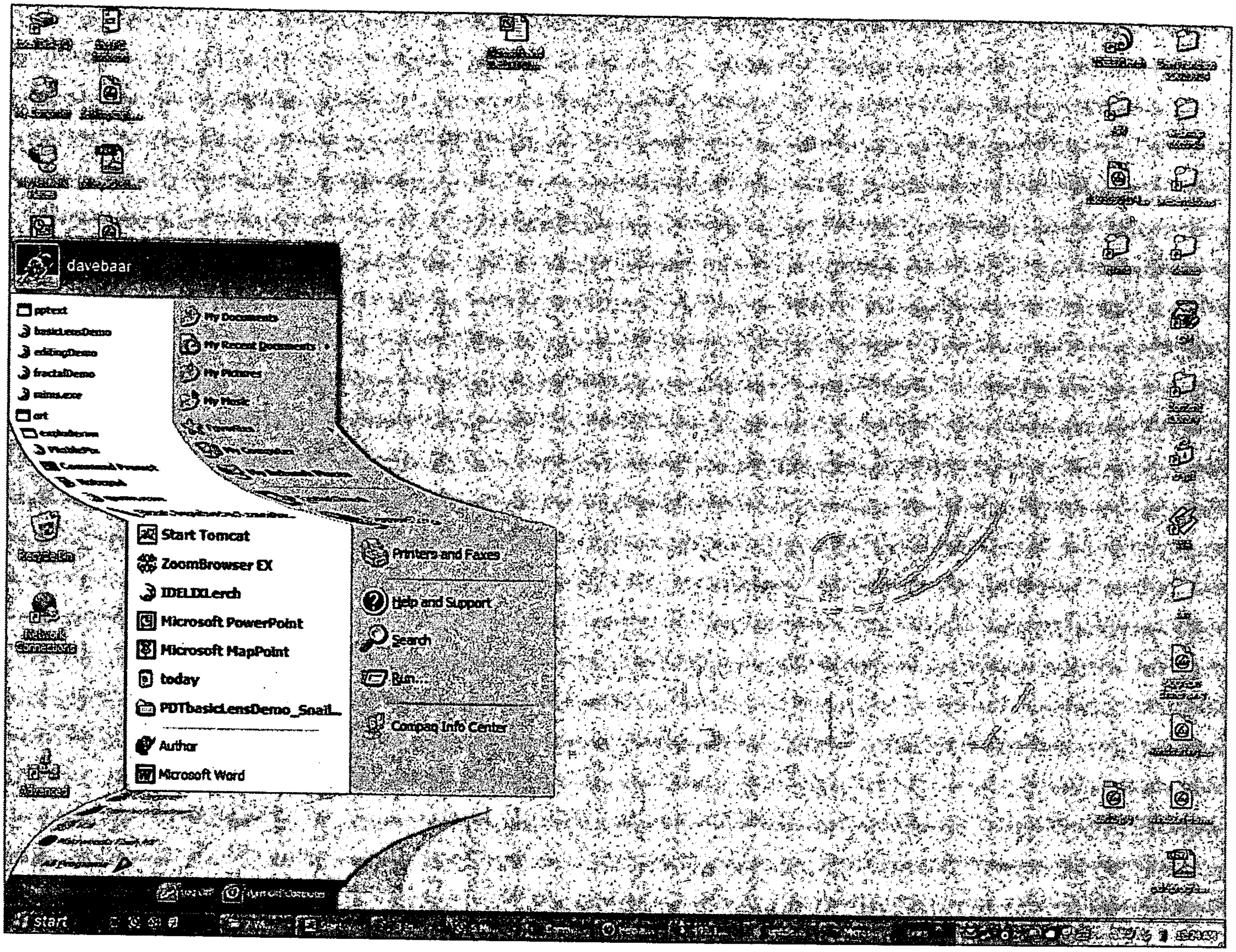
pptext
basicLensDemo
editingDemo
fractalDemo
Command Prompt
Notepad
Start Apache in Console
Start Tomcat
ZoomBrowser EX
Microsoft PowerPoint
Microsoft MapPoint
today
Author
Microsoft Word
Designer
Internet Explorer
Macromedia Flash MX
All Programs
My Documents
My Recent Documents
My Pictures
My Music
Favorites
My Computer
My Network Places
Control Panel
Connect To
Printers and Faxes
Help and Support
Search
Run...
Compaq Info Center
start

FIG. 5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My Pictures
My Music
Start Tomcat
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Microsoft PowerPoint
Microsoft MapPoint
today
PDTbasicLensDemo_Snail...
Author
Microsoft Word
Printers and Faxes
Help and Support
Search
Run...
Compaq Info Center
Recycle Bin
Network Connections
Advanced
start

FIG. 6